

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Method of and Apparatus for the Connecting of Workpieces, more particularly Wooden Workpieces, by means of an Adhesive Substance

5 We, GUNTER GIESECKE, GERHARD GIESECKE and KAROLINE GIESECKE, all of Mitterteicher Strasse 16, Tirschenreuth/
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and of German nationality, all trading as
HUBEL & PLATZER of Tirschenreuth/
Oberpfalz, Germany, do hereby declare the
invention, for which we pray that a patent
may be granted to us, and the method by
which it is to be performed, to be particu-
larly described in and by the following state-
ment:—

15 The invention relates to a method of and
an apparatus for the end-to-end connection of
workpieces, more particularly wooden work-
pieces, by means of an adhesive substance, the
said workpieces being provided at their end
20 faces with dove-tailing or a similar configura-
tion, and wherein the workpieces are tempor-
arily pressed against one another for the
purpose of connecting them together at their
processed end faces which have been pro-
25 vided with adhesive substance.

Apparatus of this kind are known which
operate in a timed manner in such a way
that the workpieces which are laid on sup-
porting tables and arranged separately from
30 one another for connection e.g. gluing to-
gether, are moved towards one another by
movement of the supporting tables relatively
to one another, and in this operation are
pressed against one another in order to pro-
35 duce the gluing pressure. Whilst the applica-
tion pressure is exerted, and also during the
setting of the adhesive substance, the work-
pieces are in a condition of rest, so that no
continuous feeding movement can take place.

A machine for the production of parts of
cabinetwork panels from strips is also known
wherein a supporting table tapering in the
direction of feed of the strip is provided with
a glue application device for the longitudinal
45 sides and a glue application device for the
end faces of the strips, and feeding and press-
ing devices are arranged which connect the
strips to one another continuously at their
end faces. But in this case the essential feature
is the lateral gluing i.e. the gluing which is
50 effected at the longitudinal sides of the strips,
whilst the strips at their end faces only abut
flush on one another and are substantially
only provided with glue at these end
55 faces in order to avoid having marked
joint gaps between the end faces of the strips
which would later make their presence
apparent after the middle layer is veneered.
Since cross-grain wood does not allow a load-
60 bearing glued connection, a true connection of
the strips at their end faces is not possible.

Furthermore, in that known machine a
continuously effective but only slight longi-
tudinal application pressure is produced in
that the feed rollers are given a slower rota-
65 tional speed than the drawing-in rollers so that
a slight detaining effect is constantly produced
as the workpieces are advanced. This method
permits of applying only a very slight and
non-regulatable application pressure in the
70 longitudinal sense over the entire length of
the strip, a pressure which is not capable of
producing a load-bearing connection of the
workpieces to one another at their end faces.

In contrast, the invention aims at providing
75 a method and an apparatus which are in-
tended exclusively for the longitudinal con-
nection of workpieces which are only arranged

[Price 4s. 6d.]

in a row one behind the other and which are provided at their end faces with dovetailing or a similar configuration guaranteeing a large surface for taking the adhesive substance. The adhesive substance, which is applied to the surfaces which extend approximately parallel to the longitudinal axis of the workpieces, i.e. in the case of wood approximately parallel to the longitudinal direction of the fibres, is to produce load-bearing connections of high strength values which require that the wood pieces are pressed into one another with high pressure, overcoming the preload resulting e.g. from the dovetailing.

Accordingly, in a method for the longitaining connection of workpieces provided at their end faces dovetailing or a similar configuration, by means of an adhesive substance, and more particularly workpieces consisting of wood, wherein the workpieces are temporarily pressed against one another at their processed ends which are provided with adhesive substance, the invention provides that the workpieces are given a continuous feeding movement and, in order to produce the connection or several simultaneous connections, the feeding movement of the forward workpiece in each case, considered in the direction of feed, is delayed relatively to the feeding movement of the following workpiece or workpieces temporarily to effect the pressing of the workpieces together by a braking means which participates in the delayed feed movement and is automatically brought into operating, at a specific position of the connection region or regions.

A particularly convenient form is obtained if the control is electrical and is effected on the basis of capacity measurement at a glued connection region. A connection region in each case can, in a manner known *per se*, be made to pass through a heating zone and then possibly through a cooling zone before the connected workpieces are further processed, in order to shorten the setting time for the adhesive substance as the workpieces are fed through the apparatus.

A preferred form of the apparatus for carrying the method into effect uses a compression element which is a pressure cylinder or a pressure cushion filled with pressure medium, the magnitude of the counter-pressure occurring at the said compression element as the workpieces are fed along being adjustable.

With the method and apparatus according to the present invention, on the one hand no interruptions in the feeding movement of the workpieces are produced and on the other hand no continual slight detaining effect is produced during the feeding of the workpieces, but instead longitudinal application pressures are provided which are always applied to the workpieces intermittently during the feeding only when the workpieces are

to be pressed together at a joint face or simultaneously at several joint faces. For this purpose it is true that whilst using a continuous feeding movement for the workpieces use is also made of an arrangement whereby movement is delayed, but in contrast to the known machine this is achieved by delaying the particular forward workpiece relatively to the feeding movement of the following workpiece or workpieces temporarily i.e. only during the time taken to execute the pressing together. In this way, the method according to the present invention makes it possible to apply to every connection region or possibly simultaneously to several successive connection regions if appropriate, considerable longitudinal application pressures the intensity of which can be adapted to the particular dimensions of the workpieces.

Further features of the invention will become apparent from the following description of the preferred form of embodiment of the apparatus for carrying the method into effect which is shown in the accompanying drawing.

According to the drawing, there is arranged on the fixed load-bearing stand 1 a feed system 2 comprising rollers and adapted to introduce the workpieces 3 which are to be glued together e.g. wooden workpieces, into the apparatus or machine and at the same time to provide them with a pressure in the direction of feed which is adequate for pressing the joints e.g. dovetail joints, together. Downstream of the feeding device there is arranged, with some spacing therefrom, a counter-pressure slide 4. This is provided, for connection with each workpiece 3, with a pneumatic or hydraulic pressure cushion 9 with which a counter-plate 20 loaded by a spring element 21 is associated.

A control valve 8 which is constructed e.g. as an electromagnetic valve is arranged in the pressure medium conduit leading to the pressure cushion 9. A switch 7 with circuit breaker is arranged in the circuit containing the electromagnetic valve.

Arranged in the zone of maximum pressure between the feeding system 2 and the counter-pressure slide 4 are two condenser plates 5 which are situated in a high-frequency control circuit *a, b*. A current relay 6 is arranged in this circuit. Arranged after the switch 7 is a break switch 11 which is operated by the pressure of a pressure medium contained in a pressure cushion 10 associated with the counter-pressure slide 4. Also arranged in the high-frequency control circuit is a rotary condenser 12 which is used for regulating the capacitive current for various workpieces, more particularly for wood of varying moisture content.

Finally, there is arranged downstream of the counter-pressure slide 4, as viewed in the direction of feed, in a manner known *per se* a heating zone 13 by means of which the setting

time for the adhesive substance at the particular connection region passing through can be shortened.

5 The apparatus which has been described hereinbefore operates in the following manner. When, in the continuous advance of the work-
pieces 3, a connecting region provided with
an adhesive substance e.g. glue whose dielectric
10 constant is greater than that of the work-
piece, arrives between the condenser plates
5, the amplifier system with the current relay
6 which is provided in the high-frequency
control circuit *a*, *b* responds and closes the
15 switch 7 which is provided with circuit-breaker
means. As a result, the electromagnetic valve
8 allows the liquid or gaseous pressure
medium to flow into the pressure cushion 9 of
the counter-pressure slide 4. This *per se* known
20 pressure cushion presses the workpiece travel-
ling in the direction of feed fast against the
counter-pressure slide 4. The latter also moves
in the direction of feed, whereby pressure is
produced in the pressure element 10 which
25 acts in a direction opposite to the direction
of feed, and which may be constructed as a
pressure cushion of elastic material e.g. solid
rubber or as a mechanical compression or
tension spring, but may also be constructed
30 as a pneumatically or hydraulically operating
pressure cylinder or hose, a pressure which is
directed oppositely to the direction of feed
and is regulatable by means of the break
switch 11, and as a result the workpieces 3
35 are pressed against one another at their end
faces. When the pressure set at the break
switch 11 is reached, this switch interrupts
the current-conducting line to the electro-
magnetic valve 8 so that the pressure medium
40 in the pressure cushion 9 of the counter-
pressure slide 4 escapes and the pressure stored
up in the pressure cushion 10 pushes the
counter-pressure slide back into its initial
position. The break switch 11, which can be
45 constructed as an electro-hydraulic switch, an
electro-pneumatic switch or as a mechanical
pull switch, is connected to the current relay
6 and switches on again after the discontinu-
ance of the load current and the reduction of
the counter-pressure.

50 The operations which have been described are repeated when the next connection region of the workpieces arrives between the con-
denser plates 5.

55 As already mentioned, in order to shorten the setting distance required by the adhesive substance, the workpieces can, after the
pressing operation, travel through a heating
zone 13 which can be provided with contact
heating means, infra-red heating means or
60 combinations of these means. The drawing
shows diagrammatically the possibility of using
a high-frequency heating means. In this case
the electrodes 14 are connected at the ter-
65 minals *c* and *d* to the high-frequency gener-
ator. The heating action is continuous during

operation of the apparatus. With high-fre-
quency heating, the glue joint is preferred
owing to the higher dielectric constant of the
adhesive substance.

It is possible to follow the heating zone 13
70 by a cooling zone 15 in which the workpiece
3 is cooled before further processing by con-
tact with the machine stand 1 and by con-
vection.

At the rear end of the machine, finally,
75 there can be arranged a clamping device 16
which is used when connecting together work-
pieces which do not require high pressing-
together pressures such as e.g. strips of wood
having a small cross-section. With this kind
80 of pressing, the pressure zone is situated be-
tween the clamping device 16 and the feed-
ing system 2. The counter-pressure slide 4
with the condenser plates 5, the amplifier and
current relay 6, the switch 7 with circuit
85 breaker means, the electromagnetic valve 8,
the pressure cushions 9 and 10, the break
switch 11 and the rotary condenser 12 can in
this case be left inoperative.

The clamping device 16 consists of a stirrup
90 member 17 which is connected fast to the stand
1, a screwthreaded spindle with handwheel
18 and a clamping shoe with two rollers 19.
The counter-pressure in the longitudinal direc-
tion is brought about by the fact that the
95 clamping shoe 19 with the screwthreaded
spindle 18 by means of the stirrup 17 presses
the workpiece 3 firmly against the stand 1 and
produces friction.

100 Instead of a screwthreaded spindle 18, it
would also be possible to use in the clamping
device 16 pressure cylinders and pressure
hoses with hydraulic or pneumatic pressure
media, and also clamping shoes without rollers.

WHAT WE CLAIM IS:—

105 1. Method of connecting end-to-end, by
means of an adhesive substance, workpieces
provided at their end faces with dovetailing or
a similar configuration, more particularly
110 wooden workpieces, wherein the workpieces are
pressed temporarily against one another for
connecting purposes with their end faces which
have been provided with adhesive substance,
wherein the workpieces are given a continuous
115 feeding movement and, in order to effect the
connection or several simultaneous connections,
the feeding movement of a forward workpiece
in each case, as viewed in the direction of
feed, is delayed relatively to the feeding move-
120 ment of the following workpiece or work-
pieces temporarily to effect the pressing of
the workpieces together by a braking means
which participates in the delayed feed move-
ment and is automatically brought into opera-
125 tion at a specific feed position of the con-
nection region.

2. Method according to claim 1, wherein
the braking means is an elastic means and is
brought into operation electrically on the basis

of capacity measurement at the glued connection region.

3. Method according to claim 1 or 2, wherein the connection regions of the workpieces pass through a heating region to shorten the time required for the adhesive substance to set, and then, before further processing of the connected workpieces, through a cooling zone if necessary, as the workpieces are advanced.

4. Apparatus for carrying out the method according to any one of claims 1 to 3, wherein a counter-pressure slide is arranged upstream, of the feed direction, of a feeding system for the workpieces, the said slide being adapted to be pressed against a forward workpiece and, during the feeding of the workpieces, is adapted to be displaced with a delaying action along with the said workpiece in opposition to the action of an elastically yieldable tension or compression element.

5. Apparatus according to claim 4, wherein the compression element is in the form of a pressure cushion of elastic material which is arranged upstream of the counter-pressure slide and which acts in opposition to the direction of feed.

6. Apparatus according to claim 4, wherein the compression element is a pressure cylinder filled with pressure medium or a pressure cushion, it being possible to adjust the maximum value of the counter-pressure of the said pressure element produced when the workpieces are fed along.

7. Apparatus according to any one of claims 4 to 6, wherein the counter-pressure slide is provided, for temporary pressing against a workpiece, with a pneumatic or hydraulic pressure cushion whose counter-plate is loaded by a spring element.

8. Apparatus according to claim 7, wherein in the pressure medium conduit of the pressure cushion of the counter-pressure slide there is arranged a control valve which is constructed in a manner known *per se* as an electromagnetic valve.

9. Apparatus according to claim 8, wherein in the circuit extending through the electromagnetic valve there is arranged a switch with circuit breaker which can be operated through the agency of a current relay in dependence on the capacity at the connection region of the workpiece arriving between two condenser plates of a high-frequency control circuit.

10. Apparatus according to claim 9, wherein in the high-frequency control circuit there is arranged in a manner known *per se* a rotary condenser for regulating the capacitive current for various workpieces, more particularly for wood having varying moisture contents.

11. Apparatus according to claims 9 or 10, wherein after the switch there is arranged a break switch which, operated by the pressure of pressure medium contained in the pressure cushion arranged upstream of the counter-pressure slide, at the maximum value thereof, is adapted to interrupt the circuit through the electromagnetic valve in order to discontinue the pressing of the counter-pressure slide against the workpiece.

12. Apparatus according to any one of claims 4 to 11, wherein there is arranged after the counter-pressure slide, considered in the direction of feed, a heating zone for shortening the setting time of the adhesive substance at a particular connection region.

13. Method of connecting workpieces end-to-end according to claim 1 substantially as hereinbefore described.

14. Apparatus for connecting workpieces end-to-end according to claim 4 substantially as hereinbefore described with reference to the accompanying drawing.

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COMPLETE SPECIFICATION

1 SHEET

*This drawing is a reproduction of
the Original on a reduced scale*



